MISSOURI resources

Spring / Summer 2013 • Volume 30 • Number 2

Missouri Resources
30 YEARS

director's comment

I count myself among those that consider time spent outdoors as not only good adventure, but good for the soul. Whether it is working in the garden, walking the dogs or meeting dawn's first light while awaiting the magical sound of a gobbler, many of my fondest memories were created outdoors.

There are many great leaders who also appreciated the time they spent in nature. They were determined to create a legacy that would preserve and protect these outdoor spaces through parks, forests, preserves and trails the public could enjoy for years to come.

"The wonder of Nature is the treasure of America. What we have in woods and forest, valley and stream, in the gorges and the mountains and the hills, we must not destroy. The precious legacy of preservation of beauty will be our gift to posterity," according to Lyndon Baines Johnson, our 36th President of the United States.

Johnson signed into law the National Trails System Act in 1968, which established national recreation, scenic and historic trails. Last month, Missouri proudly accepted the title of Best Trails State, given by the American Trails, a national, nonprofit organization working on behalf of the nation's hiking, biking and riding trails. The national award is presented every two years to the state that has made tremendous contributions to promote and improve their trails system.

Our Missouri State Parks offers almost 1,000 miles of managed trails and 2,900 acres of motorized riding areas. Missourians can walk, hike or bike on incredibly diverse trails throughout its 87 state parks and historic sites. Exploring our trail system not only provides us with great adventure, it also provides us with an opportunity to improve our overall health and well-being.

Mrs. Lyndon B. Johnson was correct when she said, "A beautiful America will require the effort of government at every level, of business, and of private groups." Missouri's award-winning trail system would not be possible without the financial commitment and support of many agencies, businesses, organizations and, most importantly, the public.

We hope all Missourians will help us celebrate this honor by enjoying one of our spectacular trails this summer, perhaps on June 1 during National Trails Day. Check out mostateparks.com for additional details about events near you. Happy hiking!

Sara Parker Pauley
Missouri Department of Natural Resources

MISSOURI resources

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Mission Statement
The mission of the Missouri Department of Natural Resources
is to protect, preserve and enhance Missouri's natural, cultural and energy resources.

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MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

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Above: Built in 1891 as part of the Chain of Rocks Plant, the Intake Water Tower #1 once drew water from the Mississippi River. The river water was treated in sedimentation basins and converted to drinking water for the city of St. Louis.
Front cover: The hatchery dam at Bennett Spring State Park is a popular place for trout fishermen.
Back cover: Dew droplets are suspended within a spider web on a warm spring morning.
DNR photos by Scott Myers.

Missouri's Geological

by Joe Gillman photographs by Scott Myers

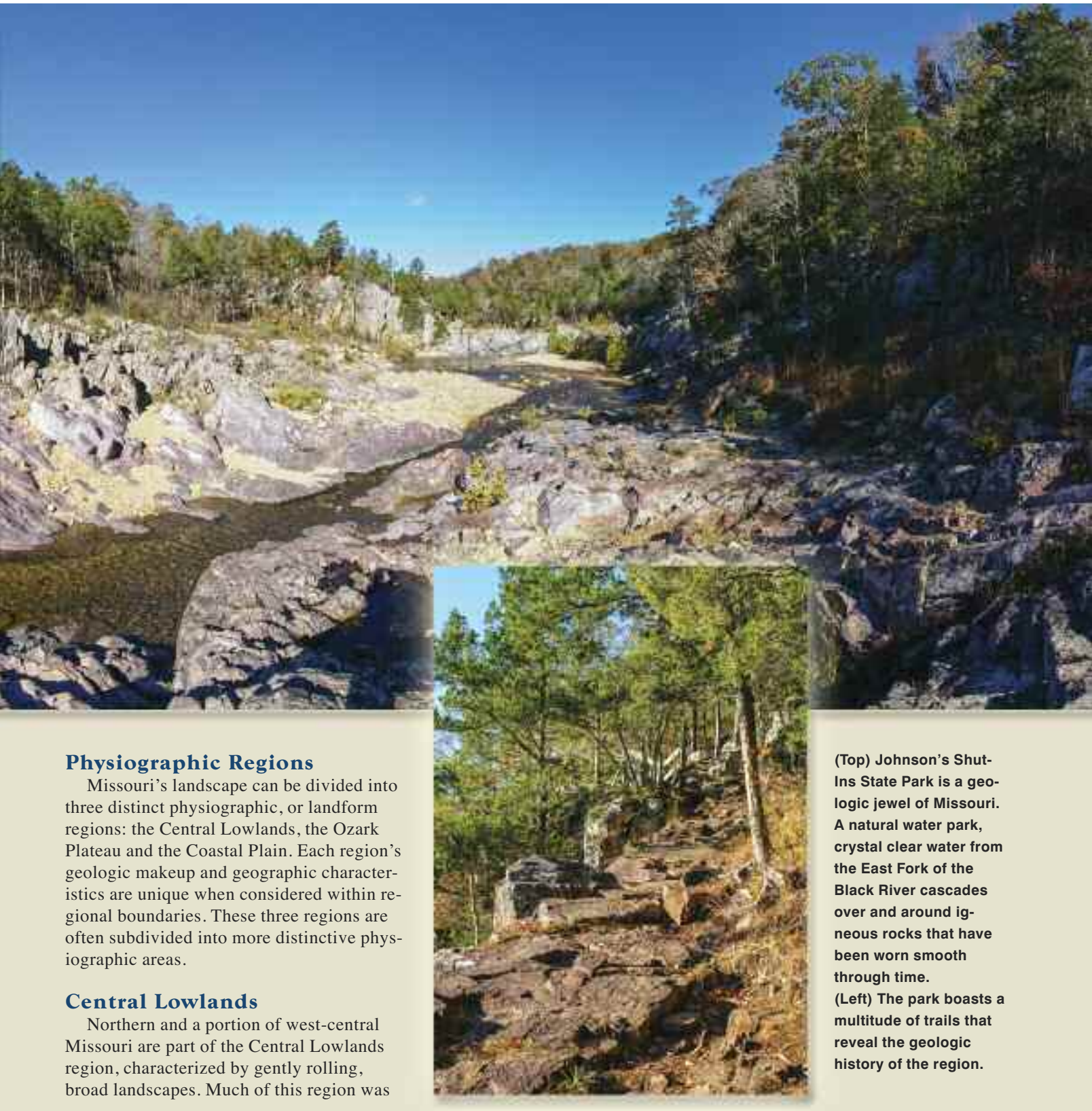
Missouri boasts one of the nation's best and most recognized state park systems. From hiking to camping, many fascinating geologic treasures await visitors. Often, these natural areas are so rare they have been recognized as places that deserve protection and public enjoyment. Thus, they became state parks.

The geology in Missouri state parks is as diverse as many of the activities available to visitors.

"In some ways, geology was the primary force that created many of our state parks today," said Bill Bryan, director of Missouri State Parks, a division of the Missouri Department of Natural Resources. "These unique geologic features are one of the main reasons more than 18 million people visit our state park system every year."

Evidence of extinct volcanoes, glaciers, cave systems, earthquakes and old mines are just a few of the interesting things to see. Not only are some of North America's oldest rocks exposed in the remnants of ancient volcanoes, relics from the most recent glacial period also exist. These processes leave us with incredible reminders of Missouri's distinctive beauty and geologic history. World-class geologic features can be seen in many state parks, including Bennett Spring, Johnson's Shut-Ins, Onondaga Cave, Grand Gulf and Elephant Rocks.

Showcases



Physiographic Regions

Missouri's landscape can be divided into three distinct physiographic, or landform regions: the Central Lowlands, the Ozark Plateau and the Coastal Plain. Each region's geologic makeup and geographic characteristics are unique when considered within regional boundaries. These three regions are often subdivided into more distinctive physiographic areas.

Central Lowlands

Northern and a portion of west-central Missouri are part of the Central Lowlands region, characterized by gently rolling, broad landscapes. Much of this region was

(Top) Johnson's Shut-Ins State Park is a geologic jewel of Missouri. A natural water park, crystal clear water from the East Fork of the Black River cascades over and around igneous rocks that have been worn smooth through time.
(Left) The park boasts a multitude of trails that reveal the geologic history of the region.

(Above) At Finger Lakes State Park, near Columbia, the hilly terrain left behind following coal extraction in the 1900s provides the perfect setting for a challenging mountain bike trail ride. Strip-mine pits also offer recreation opportunities like swimming, canoeing and fishing.

shaped by the advance and retreat of major ice sheets during the ice age. Remnants of these geologic events can be found in the thick glacial material left behind and the occasional boulder transported here from Minnesota or Canada. This region also is home to the gentle topography of the Osage Plains, a non-glaciated great prairie that opens to the west.

During the ice age, fine-grained sediments were deposited along the major river valleys. Many of the particles were later blown into ridges of dune-like hills that rise above the surrounding landscape. An example is "The Pinnacles" area in Van Meter State Park, where visitors can hike along a geologic feature directly linked to glaciers that once dominated the landscape. Other parks that exhibit remnants of glaciated terrain include Thousand Hills State Park and Crowder State Park.

Geology played a key role in the development of Finger Lakes State Park, located along the southern boundary of the Central Lowlands. In this region, during an ancient geologic time period, plant-rich swamps left behind thick deposits of coal. The coal was later extracted from the ground, leaving many piles of mined earth and water-filled strip pits.

The rugged playground is a popular destination for all-terrain vehicle and mountain bike enthusiasts. Although this landscape is man-made, the careful observer can still see the geologic features and coal outcroppings that led to the creation of this park.

Ozark Plateau

The Ozark Plateau region, likely the most recognizable, is characterized by a broad, uplifted region that occupies much of central and southern Missouri. This area is primarily underlain by thick sequences of limestone and dolomite bedrock that host topography and features that are world famous. These karst geologic conditions created the perfect environment for development of spectacular natural features. The striking geologic characteristics of this region produced monumental springs, extensive networks of caves, steep bluffed valleys and clear, flowing streams.

Quite possibly Missouri's most impressive karst-related complex consists of a large, collapsed cave system within Grand Gulf State Park. Evidence of these broken, faulted rocks can be seen along the walls of the chasm. Part of the former cave roof is intact, forming a natural bridge. Hiking trails allow visitors to explore these rare geologic features that provide a glimpse into the inner workings of a subterranean world.

These karst features also produced some of the largest springs in the Midwest. Bennett Spring State Park, Roaring River State Park and Montauk State Park are all situated around magnificent springs that are the discharge points for karst systems that issue forth cold, clear groundwater from Missouri's depths. Wonderful recreational opportunities abound in these parks, such as

fishing, camping, hiking and geologic discovery. Other remarkable geologic features occurring in these parks include Bennett Spring Natural Tunnel and Devil's Kitchen at Roaring River State Park.

"As an avid fly angler, I have had the opportunity to fish for trout throughout the U.S. My favorite waters are still the cold, clear spring-fed creeks of Missouri," said Mark Van Patten, Missourian and nationally known fly fisher, author, and host of the PBS series, *The Tying Bench*. "When the blue ribbon trout streams in many of the mountain states are frozen over, our groundwater springs burst forth at a perfect 54 degrees, allowing for a fantastic fly fishing adventure year round."

If one's preference is caves, Onondaga Cave and Cathedral Cave in Onondaga Cave State Park, Ozark Caverns in Lake of the Ozarks State Park and Fisher Cave in Meramec State Park offer cave enthusiasts a one-of-a-kind geologic environment. For example, in Onondaga Cave, guides lead visitors over electrically lighted, paved walkways, and provide information about geologic wonders of the underworld, such as the King's Canopy, the Twins and other extraordinary speleothems.

This region also is home to the St. Francois Mountains, the eroded remnants of ancient volcanoes, providing a rare glimpse of igneous rocks in the nation's mid-continent. These rocks and the processes that shaped them offer spectacular geologic features at the heart of many popular state parks.

At Johnson's Shut-Ins State Park, visitors are greeted by millions of years of geologic history, and can spend hours splashing among the colorful rocks of one of nature's geologic wonders known as a shut-in. At Elephant Rocks State Park, the rounded, oblong granite boulders are not only beautiful, they are a textbook example of weathering granite. These pink "elephants" rest at the core of the Ozark Mountains and provide a glimpse of Missouri's volcanic past.

Taum Sauk Mountain and Sam A. Baker state parks also offer spectacular geologic features created by these ancient and dynamic volcanic processes.

Coastal Plain

The Coastal Plain region in extreme southeast Missouri is unlike any other in the state. Leveled by erosive floods, it is largely covered by very thick, river-deposited sediments. Contrasting sharply with the surrounding Mississippi River Delta, Crowley's Ridge is the region's most prominent geographic feature – an impressive, narrow series of hills across the flat landscape.

Visitors to Morris State Park can observe the distinctive geologic character of Crowley's Ridge and observe many plant species found no other place in Missouri. This area also is home to one of the most seismically active regions in the mid-continent, known as the New Madrid Seismic Zone.

The earth's natural processes shaped our environment and left remarkable remnants of our varied geologic past that are never repeated and cannot be recreated. With 87 state parks and historic sites spanning more than 145,000 acres, the Department of Natural Resources' state park system has something for everyone. Regardless of which regions you visit, you will find outstanding recreational and educational opportunities. In many of Missouri's state parks, the geologic past can be credited for providing the gems that truly inspired their designation as special places.

Joe Gillman is director of the department's Division of Geology and Land Survey and serves as state geologist for Missouri.

(Above) This natural bridge is one of several impressive geologic features that can be found in Ha Ha Tonka State Park near Camdenton. (Opposite page) The landscape of Van Meter State Park, near Miami, was formed when melting glaciers sent water rushing into rivers. Winds deposited a fine soil, called loess, on the hills that bordered the river bottoms. Gradual erosion of the loess-covered hills resulted in deep ravines and narrow ridges, known as pinnacles.

St. Louis vs. Chicago
The Water Battle of 1900-1906

by Loring Bullard

The Lost Panoramas: *When Chicago Changed its River and the Land Beyond*

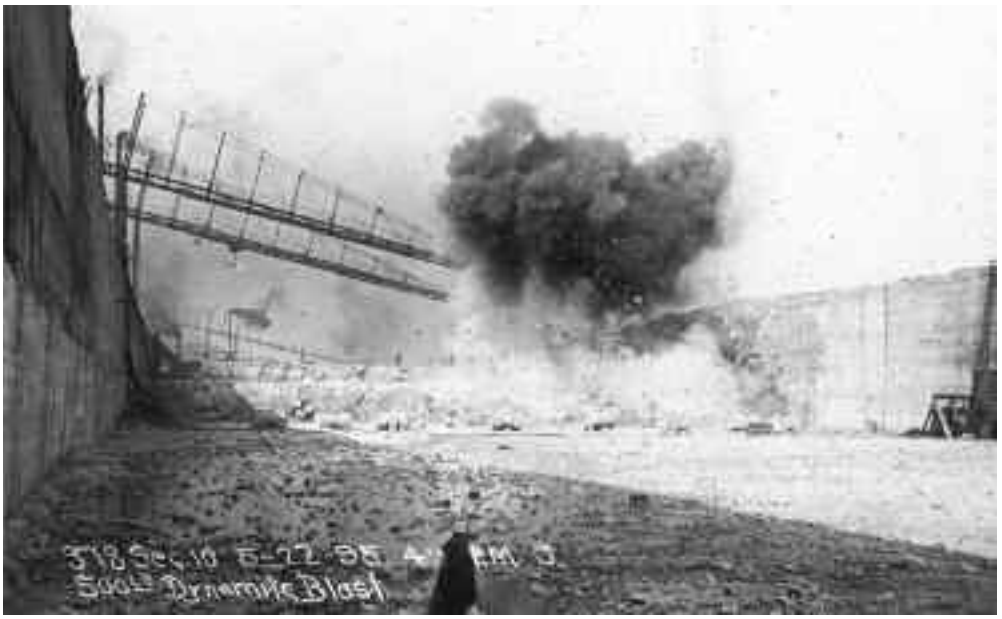
A barge passes under a drawbridge on the Chicago River in downtown Chicago in this 1911 photograph.

In the second half of the 19th century, St. Louis and Chicago vied for supremacy, each yearning to become the "megalopolis of the West." They competed for industries, rail access, population growth and public attention. To the chagrin of St. Louis, Chicago surpassed it in size in the 1870s. Both cities campaigned vigorously to host the Columbian Exposition in 1892, but Chicago won the prize. St. Louis would eventually counter by hosting the 1904 World's Fair. Shortly prior to that, potentially adding injury to insult, Chicago made a decision that resulted in the first high profile water pollution case to come before the U.S. Supreme Court.

For their public water supplies, both cities tapped the closest large bodies of water – the Mississippi River for St. Louis and Lake Michigan for Chicago. Both cities installed cutting edge sewage systems in the 1850s, but both discharged untreated sewage into their sources of drinking water, albeit several miles from the intakes.

In 1892, Chicago proceeded with a plan to protect Lake Michigan and reduce the incidence of waterborne diseases such as typhoid fever. It would accomplish this by reversing the flow of the Chicago River, sending the river and its load of raw sewage westward over a low divide toward the Illinois River. The Illinois is a tributary of the Mississippi from which St. Louis drew its drinking water – 387 miles downstream.

The Chicago Drainage Canal, built to accommodate this flow reversal, opened in January 1900. The following April, the State of Missouri, on behalf of St. Louis and other Mississippi River towns, filed a formal complaint with the U.S. Supreme



(Left) The Sanitary and Ship Canal was built to connect the Chicago River – which originally flowed into Lake Michigan – to the Des Plaines River, which then flows into the Illinois River, eventually emptying into the Mississippi. At the time, the Sanitary and Ship Canal was the largest civil engineering project in American history.
(Below) The canal, which is 28 miles long, 202 feet wide and 24 feet deep, connects to the Des Plaines River through a series of locks and dams at Lockport, Ill.

Library of Congress Prints and Photographs Division

Court, alleging that the diversion of Chicago's sewage would "poison the water supplies of the inhabitants of Missouri."

Edward Crow, Missouri's Attorney General in 1901, put it in blunter terms, asking, "what would be done with a man were he caught scattering death dealing germs along the streets of St. Louis?" He would no doubt be "mobbed with little ceremony and strung up to the first post over which a rope could be thrown." Chicago's action, Crow growled, were "none the less criminal."

Illinois Attorney General Edwin Akin did not initially contest the allegation, but filed a demurrer objection to the bill of complaint, arguing that the matter did not constitute a direct controversy between the two states and therefore did not fall within the jurisdiction of the U.S. Supreme Court. Justice George Shiras handed down the court's first opinion in January 1901, ruling that his court would indeed hear the case.

"When the health and comfort of the inhabitants of a state are threatened, the state is the proper party to represent and defend them," Shiras' opinion stated. It further stated that "contagious and typhoid diseases," if introduced into Missouri's river communities, could "spread themselves throughout the territory of the state." Finally, in a matter of such vital importance – a "situation which, if it arose between independent sovereignties, might lead to war" – the authority of the court was "not open to doubt."

Over the next few years, both sides sent experts into the field to gather information and test theories to bolster their respective cases. This, in fact, would be the first major battle of the technical water experts, with both sides arguing about the longevity of typhoid bacteria and other germs found in river water that attack the intestine. Could they survive the long trip from Chicago to St. Louis?

The Lost Panoramas: *When Chicago Changed its River and the Land Beyond*

(Above) The reversal of the Chicago River dumped massive amounts of sewage and industrial pollution into the westward-flowing rivers and actually doubled the size of the Illinois River.

In 1903, the Hon. Frank Bright, special commissioner assigned to hear the case, took a two-week steamboat trip down the Illinois River to gather testimony and to see for himself the effects of the reversed river.

The U.S. Supreme Court heard arguments in the case from 1903 to 1905. John Alvord, a prominent engineer and an expert witness for Missouri, stated his opinion that "in all human probability the rise in typhoid deaths in the city of St. Louis in the last few years has been caused by the added typhoid contamination from the Sanitary District of Chicago."

James Todd, representing the Sanitary District, pointed out that Alvord's charts also showed a significant rise in typhoid deaths in St. Louis between 1898 and 1900, *before* the opening of the canal. He suggested the city look for closer sources of contamination, such as sewage from St. Charles, a mere 40 miles above the St. Louis water intake.

In February 1906, the court rendered its final opinion. Justice Oliver Wendell Holmes, authoring the majority decision, marveled at the scientific advances brought to light during the proceedings. He noted that establishing the relevant facts had required the "most ingenious experiments, and for their interpretation, the most subtle speculations of modern science," although there were "categorical contradictions" between the two sets of experts.

Holmes was reluctant to frame too sweeping an indictment of the discharge of untreated sewage into rivers, something that many large cities still did at the time. A question of the "first magnitude," he suggested, was whether the "destiny of the great rivers is to be protected against everything which threatens their purity."

Holmes supported the defendant's claim that even if some typhoid germs did survive the journey, they would be "scattered and enfeebled and do no harm" by the time they reached St. Louis. Further, he noted that the Illinois River, formerly a "sluggish and ill smelling stream," had actually been improved by the huge inflow of Lake Michigan water pouring through the canal. Water from the Illinois was now even drunk by fishermen, reportedly "without evil results."

He also warned Missouri to be careful in pointing fingers. After all, St. Louis and other Missouri cities discharged raw sewage into the Mississippi. If this suit were to succeed, Missouri might "find itself a defendant to a bill by one or more of the states lower down on the Mississippi."

After learning about new advances in drinking water treatment and filtration, Holmes advised that "the evidence is very strong that it is necessary for St. Louis to take preventive measures, by filtration

DNR photo by Scott Myers

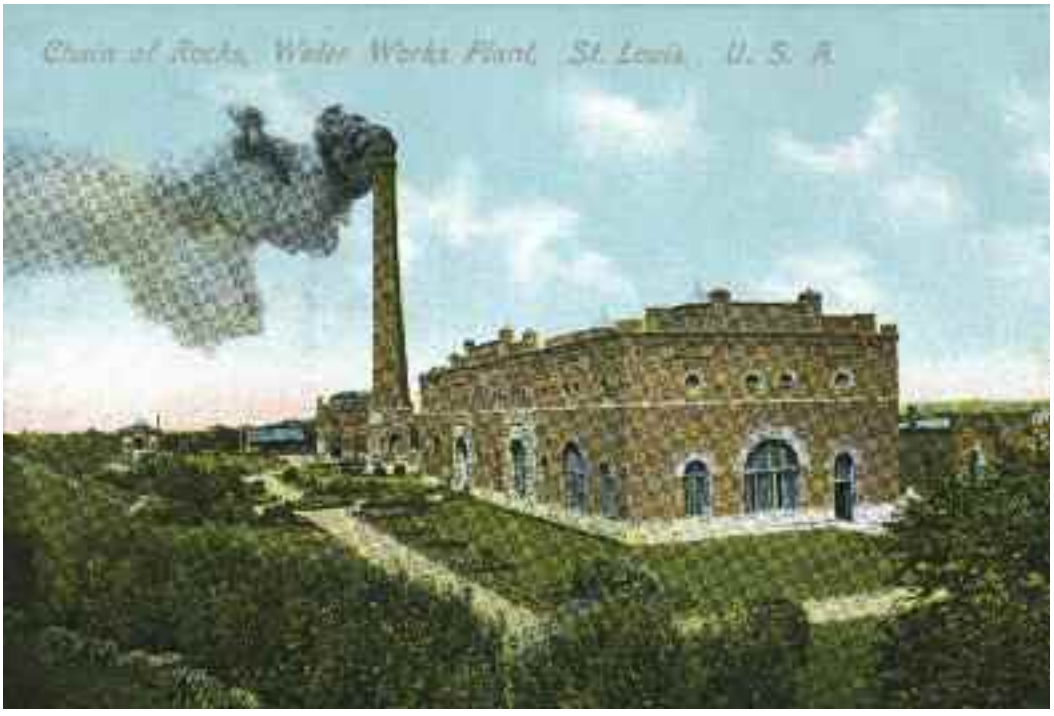
or otherwise, against the dangers of the plaintiff's own creation or from sources other than the Illinois." According to Holmes' reasoning, what "will protect against one will protect against the other." So rather than forcing Chicago to treat its sewage, an expensive and technically challenging proposition, or allowing the wastes to flow back into the city's water supply, Holmes advocated drinking water treatment for downstream users as a more practical solution to the problem.

The Supreme Court dismissed the complaint without prejudice. St. Louis lost the case, but eventually heeded Holmes' advice. The city began filtering its public water supply in 1915. Both cities, in fact, addressed drinking water treatment long before cleaning up their own wastewater discharges. By the 1920s, Chicago had constructed three state-of-the-art – at least by the standards of that time – sewage treatment plants.

St. Louis began installing improved wastewater plants after the formation of the Metropolitan St. Louis Sewer District in 1954. It would be the early 1970s before St. Louis installed any truly advanced sewer filtration plants.

Missouri vs. Illinois established some long-standing precedents, and was mentioned in more than 600 citations in subsequent litigation. But by no means did it signal an end to interstate battles over water pollution. In 1991, Missouri watched with interest as Oklahoma sued Arkansas in federal court, claiming that a wastewater discharge permitted in Arkansas, and meeting that state's requirements, did not adequately protect the scenic Illinois River in Oklahoma, to which more stringent state water quality standards applied.

This, and many other cases, demonstrate that there may well be more water conflicts to come – skirmishes for which St. Louis and Chicago prepared the fields of battle at the dawn of the 20th century.



Original postcard in State Historical Society of Missouri Collection

(Opposite page, bottom) Missouri was concerned that the reversal of the Chicago River and subsequent dumping of Chicago's waste into the Mississippi River would contaminate St. Louis's drinking water. The city's intake was drawn from the river at the Chain of Rocks, only a few miles downstream from the mouth of the Illinois River. The two conspicuous water intakes in mid-river no longer draw water for the expansive, modern-day plant, seen in the distance.

(Left) In 1901, when the Sanitary and Shipping Canal was opened, the Chain of Rocks Water Plant pumped river water through a series of sedimentation basins. It wasn't until 1915 that the city added the Chain of Rocks Filtration Plant, the largest filter plant in the world when it was built. The plant has been continuously upgraded since. This postcard shows the Water Works Plant before it was switched from steam power to electric in 1958.

… a "situation which, if it arose between independent sovereignties, might lead to war."

Loring Bullard is the former executive director and CEO of the Watershed Committee of the Ozarks, a drinking water source protection advisory group based in Springfield. He has authored numerous stories and books on the history and state of water quality and protection in Missouri.

Your Path to Power

by Angie Morfeld
photographs by Scott Myers

As a kid, I remember making my way through the house, flipping on light switches as I went. Rarely do I recall flipping off those same switches, which would always invoke the same question from my dad, "Do you think we own stock in the electric company?"

I had never thought about it. Maybe we did own stock in the electric company. I was a kid. I didn't know.

"Electricity is something we take for granted," said Llona Weiss, director of the Missouri Department of Natural Resources' Division of Energy. "It powers our lights, computers, televisions, smart phones, kitchen appliances, and the list goes on and on. We just expect it to be there when we need it, like magic," Weiss added.

But have you ever thought about where your electricity comes from? In Missouri, depending upon where you live, your electricity comes from one of three sources: an investor-owned electric utility, a rural electric cooperative, or a municipal electric utility.

Which one serves your property was likely determined decades ago, and as a general rule, cannot be changed. In a very limited number of states where electric utility service has been

"restructured" or deregulated, customers may have a choice of utility source from which to purchase electricity, but that is not the case in Missouri. Investor-owned utilities, rural electric cooperatives and municipal utilities differ in the way they were formed and the way they are governed and covered by law.

Investor-Owned Electric Utilities

Nearly two million Missouri residential, commercial and industrial customers receive electric services from four investor-owned electric companies. They include Kansas City Power & Light Co., KCP&L – Greater Missouri Operations Co., Ameren Missouri, and The Empire District Electric Co. These investor-owned utilities are structured as for-profit corporations, and are owned by shareholders, just like other Missouri corporations. The utilities' rates and conditions of service to customers are regulated by the Missouri Public Service Commission. In 2011, Missouri's investor-owned utilities generated more than 69 million megawatt-hours of electricity, or 75.4 percent of the state's electricity production.

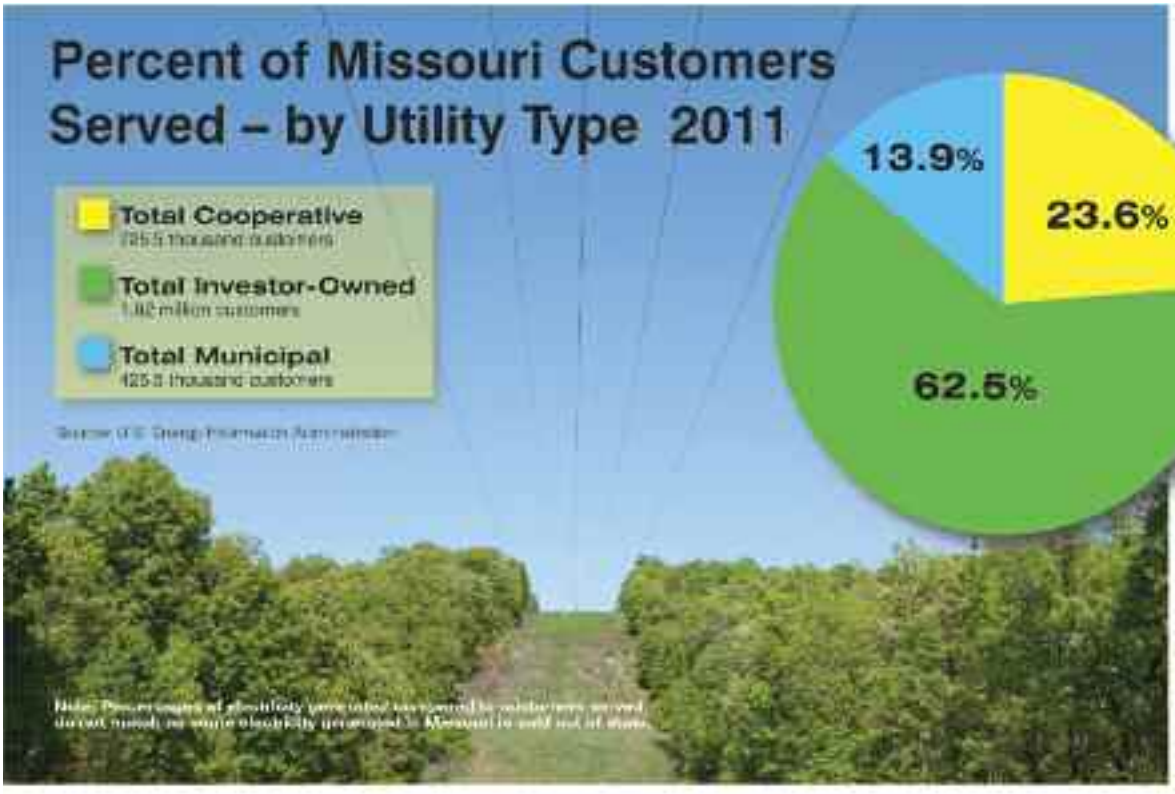
Rural Electric Cooperatives

Established in the 1930s by President Franklin D. Roosevelt's Depression-era New Deal, rural electric cooperatives were the first providers of electric services in many areas of the state.

Unlike investor-owned electric utilities, rural electric cooperatives are non-profit institutions, governed by a board of directors elected by its member-owners. Each customer is considered a member and owner of the cooperative. If a cooperative collects more in rates than its costs to operate, these funds are generally reinvested for infrastructure, held as future reserves, or distributed back to members in the form of "patronage" or "capital credits," which essentially are dividends paid on a members' investment in the cooperative.

There are two types of electric cooperatives – distribution cooperatives and generation and transmission cooperatives. There are 40 distribution cooperatives in the state, and in 2011 they served more than 725,000 residential and business customers.

The seven generation and transmission cooperatives sell wholesale power to the distribution cooperatives, either from power plants they own or through resale of power they purchase in bulk from other electricity producers in Missouri, or elsewhere. In 2011, Missouri's generation and transmission cooperatives generated more than 16 million megawatt-hours, or 18.2 percent, of the state's total.



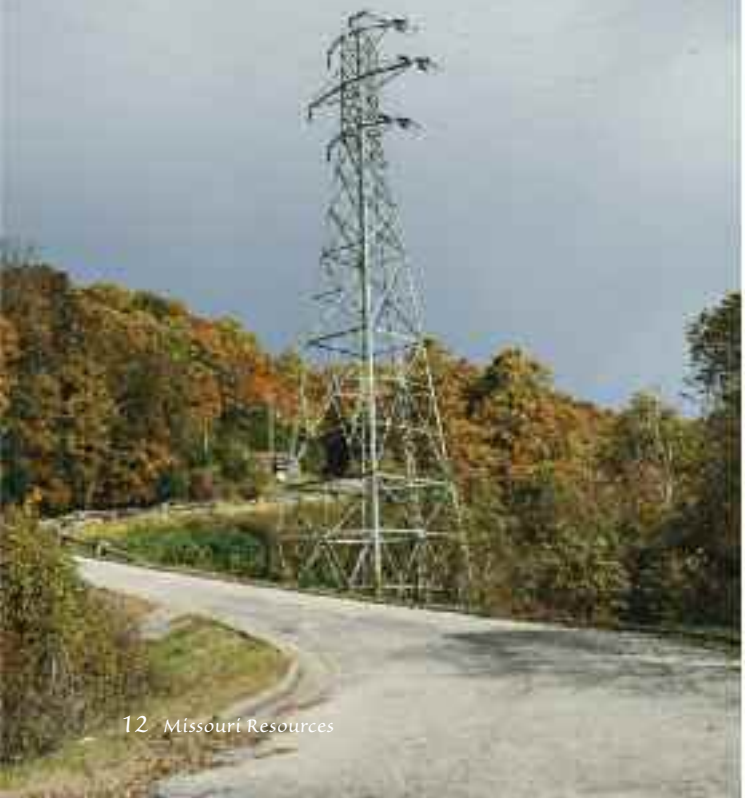
Municipal Electric Utilities

A municipal electric utility is owned and operated by a city, and provides electric services to its citizens. Not all municipal electric utilities generate their own power and may purchase power from other electric providers. Municipalities' utility rates, which are not subject to state regulations, are set by a local utility board or commission, or the municipal administration.

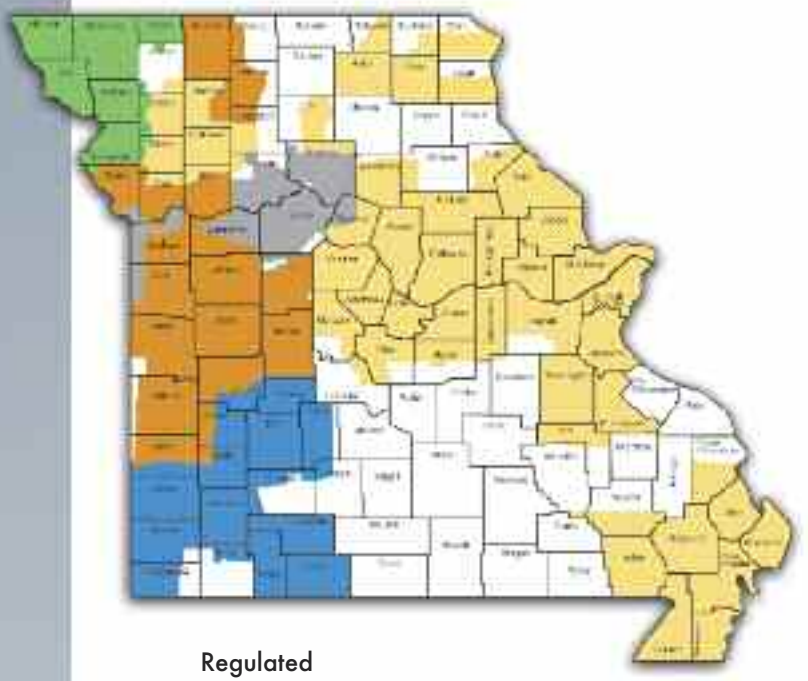
There are 88 municipal electric utilities in Missouri. In 2011, municipalities generated more than 5 million megawatt-hours of electricity, or a little more than six percent of the state's total electricity generation.

"I encourage you to take a vested interest in your electrical provider because an educated consumer is always the best consumer," Weiss said. "You may not be able to choose whether your power comes from an investor-owned utility, cooperative or municipality, but by staying fully informed, you will be aware of the incentives and programs offered."

Angie Morfeld is an information officer with the department's Division of Energy. Byron Murray, an energy planner in the division, provided technical and financial information for the story.



Missouri Electric Service Areas



Regulated

- KCP&L GMO (St. Joseph Division)
- KCP&L GMO (Mo. Public Service Division)
- Empire District Electric Co.
- Kansas City Power & Light Co.
- Ameren Missouri

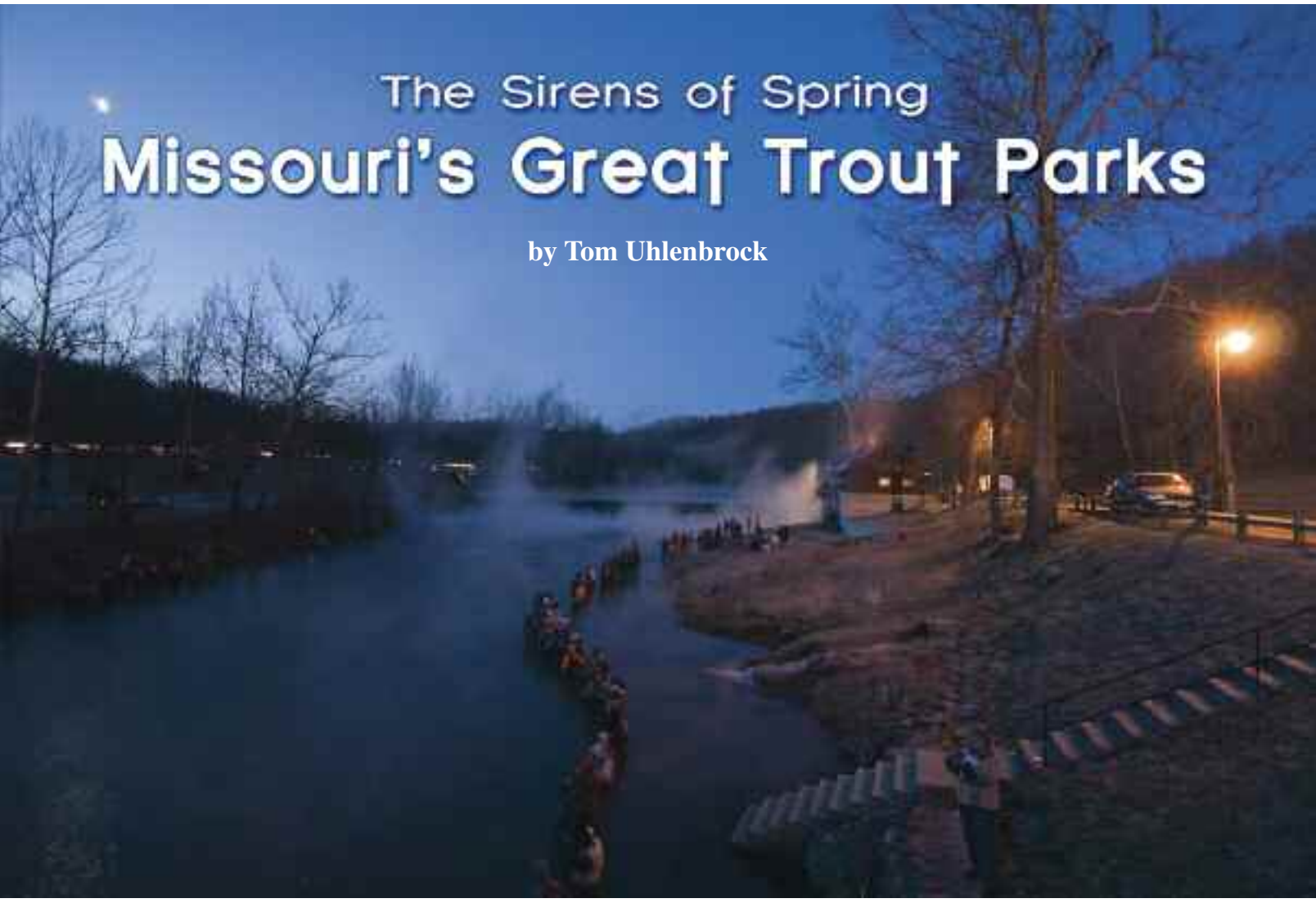
Non-Regulated

- Covered by Distribution Cooperatives

The following municipal systems exist within both regulated and non-regulated distribution areas.

Municipal Electric Systems:

Albany, Ava, Bethany, Butler, Cabool, California, Cameron, Carrollton, Carthage, Centralia, Chillicothe, Columbia , Crane, Cuba, Easton, El Dorado Springs, Farmington, Fayette, Fredericktown, Fulton, Gallatin, Galt, Gilman City, Hannibal, Harrisonville, Hermann, Higginsville, Houston, Hunnewell, Independence, Jackson, Kahoka, Kennett, Kirkwood, Lamar, La Plata, Lebanon, Liberal, Linneus, Lockwood, Macon, Malden, Mansfield, Marceline, Marshall, Meadville, Memphis, Milan, Mindenmines, Monett, Monroe City, Mount Vernon, Mountain View, New Madrid, Newburg, Nixa, Odessa, Osceola, Owensville, Palmyra, Paris, Perry, Poplar Bluff, Rich Hill, Richland, Rock Port, Rolla, Salem, Salisbury, Seymour, Shelbina, Sikeston, Slater, Springfield, St. James, St. Robert, Stanberry, Steelville, Sullivan, Thayer, Trenton, Unionville, UMC-Columbia, Vandalia, Waynesville, West Plains, Willow Springs, Winona.



The Sirens of Spring

Missouri's Great Trout Parks

by Tom Uhlenbrock

From bluegrass to bald eagles, Missouri's three state trout parks have more than just fish to offer a family seeking a weekend or week-long vacation.

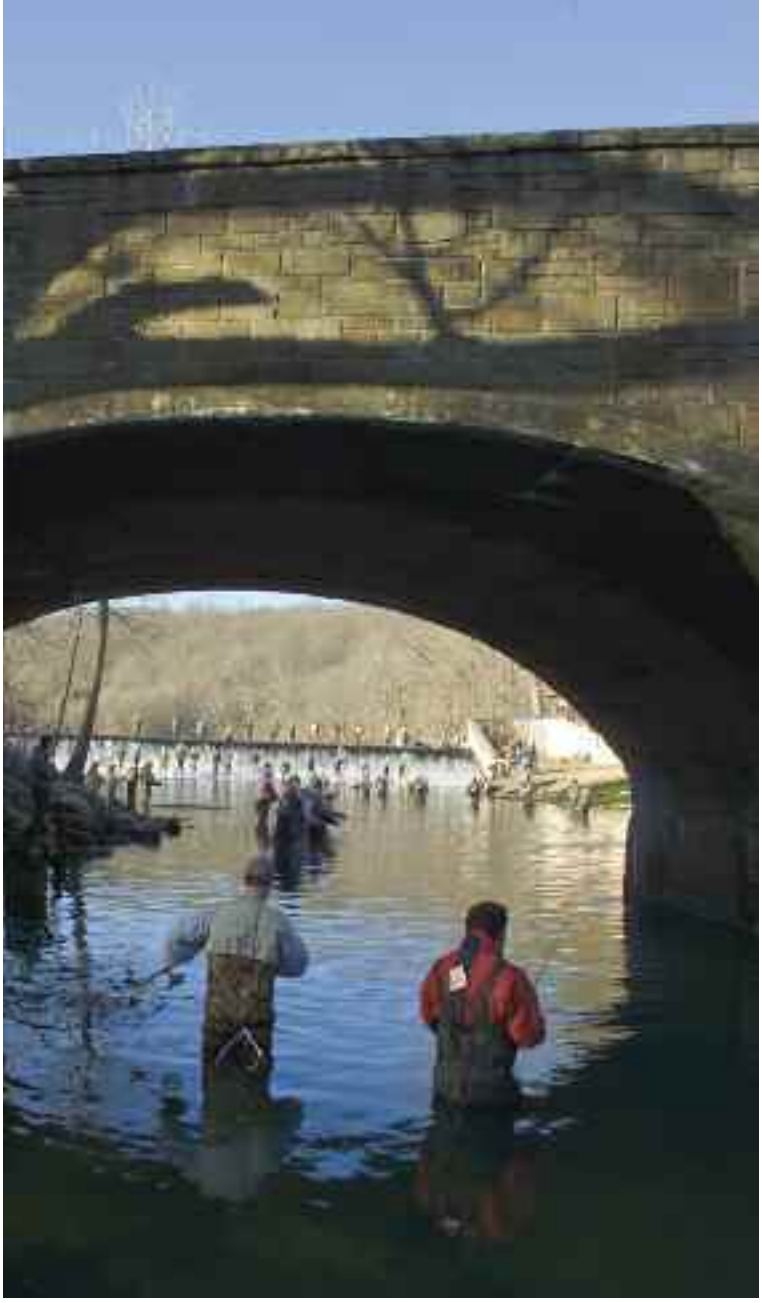
Roaring River State Park near Cassville, Bennett Spring State Park near Lebanon and Montauk State Park near Salem are the "grand old ladies" of the state park system. They were established in the 1920s, among the earliest of state parks.

The three are in similar, scenic Ozark settings. Rugged, forested hills line deep valleys that contain azure springs pumping out tens of millions of gallons of crystal clear water daily into sparkling streams.

Fish hatcheries were built to take advantage of the abundant supply of cold, clear water and supply rainbow trout that are stocked daily in the streams.

Each park averages nearly 100,000 fishermen a year. But with miles of river frontage in the parks, an angler can find a quiet spot to claim as his or her own.

(Above) Anglers line the water at Bennett Spring State Park for the opening day of trout season.
DNR photo by Scott Myers



DNR photo by Scott Myers

The sounding of the siren at dawn on March 1 marks the opening of trout season when generations of families stand shoulder-to-shoulder to catch a fish. For many, that siren also signals the long-awaited start of spring.

But the parks make attractive destinations for visitors who may never wet a line. They all feature a variety of lodging, good restaurants and plenty of programs that explain the variety of wildlife. Trails and campgrounds are available at each of the parks, and two have swimming pools.

"We do interpretative programs about every Friday and Saturday at the campgrounds during the summer," said Doug Rusk, superintendent at Montauk State Park. "We have hummingbird banding, usually twice a year, a bear program, owl prowls and night hikes to go and listen to the sounds of nature," Rusk added.

The springs, of course, are the heart of the three parks. Each has its own personality.

J.D. Muschany, superintendent of Bennett Spring, said many visitors make the short walk back to the spring boil along the base of a hillside. You can peer into the clear water at the trout floating in the reeds along the bank, while the other side is full of anglers tossing lures their way.

"One of the best things to do is just walk across the bridge back to the spring and enjoy the wildlife, the activity of the anglers, the great blue herons and other birds," Muschany said. "There a lot more to do here than just fish."

(Left) Anglers are framed by a triple-arch bridge built by the Civilian Conservation Corps at Bennett Spring. (Bottom) Dave Mulcahy of St. Louis (left) and Don Johnson of Camdenton depart from Montauk State Park on a float down the Current River.

DNR photo by Tom Uhlenbrock

Dusty Reid, superintendent at Roaring River State Park, noted that wet weather can create a waterfall that drops 110 feet from the top of a bluff into the deep blue pool of Roaring River Spring, which bubbles up from a rocky grotto lined with lush ferns and mosses.

"Spectacular," was his description.

Here's some of what you'll find at each of the state trout parks:

Roaring River State Park, south of Cassville:

From the spring at the park, some 20 million gallons of water flow each day into Roaring River, which empties into nearby Table Rock Lake.

The park features the Emory Melton Inn and Conference Center, which offers 26 rooms and a fully equipped store. The park also has more than 180 campsites, a motel and cabins of various sizes.

On Friday nights in the summer, bluegrass bands play at the outdoor amphitheater. Like the other two parks, Roaring River retains the stone-and-timber architecture built by the Civilian Conservation Corps in the 1930s. The park has a swimming pool, and the old rock bathhouse has become a handsome visitor's center.

"We have wildflower workshops in April and May, and I always enjoy the fall colors down here," said Reid. "There are a lot of arts and crafts festivals in the area in the fall."

Bald eagles show up at the park in October, and Reid and other park staffers spotted a special visitor last summer.

"We got to see a black bear," he said. "He was crossing the highway."

DNR photo by Kerry Hays

(Above) Wet weather creates a waterfall that drops into the deep blue pool of the spring at Roaring River State Park.

DNR photo by Scott Myers

Bennett Spring State Park, near Lebanon:

Bennett Spring is the fourth largest in the state, releasing an average of 100 million gallons a day that feed into the Niangua River, a favorite for floaters on the west side of the state.

The spring gurgles from deep underground and flows along the base of a steep hill to pass beneath a triple-arched stone bridge that is the handiwork of the Civilian Conservation Corps.

Another vintage CCC building houses a lodge and restaurant. A nearby park store sells tackle and other supplies and offers 64 rental units, including cabins and a 10-unit motel. The campground has more than 190 spaces with four showerhouses. The park has a swimming pool for cooling off on hot summer afternoons.

The six trails total 12.5 miles. The longest trail, 7.5 miles long, takes hikers to an unusual geologic formation called the Bennett Spring Natural Tunnel, an open-ended cave that is 296 feet long.

"It's a semi-rugged terrain, going through two glades, short scrublands and a variety of tree canopies, including tall oaks," said J.D. Muschany, park superintendent. "The tunnel is a big rock arch, 295 feet long, 20 feet high and 50 feet wide."

DNR photo by Scott Myers

(Top) A short trail leads park visitors along the Spring Branch and back to Bennett Spring.
(Above) The swimming pool at Roaring River State Park is a great place to cool off on a hot summer day. It is open to park visitors from Memorial Day to mid-August. Both Roaring River and Bennett Spring state parks have swimming pools available to their visitors.

Montauk State Park, near Salem:

The spring at Montauk once was reportedly a deep, blue hole like the others. But a torrential rain in 1892 washed gravel and debris down the clear-cut hillsides and plugged the flow.

Local lore says the ground growled and grumbled for days before erupting and forming seven separate outflows. Montauk Springs now puts out some 40 million gallons of water a day, joining Pigeon Creek to form the headwaters of the Current River, the state's premier float stream.

The two top stretches of the Current – from just outside the park to Cedargrove, and from Cedargrove to Akers – are two of the best day floats, with the narrow river often flowing beneath an arch of trees lined by endless gravel bars and sandbars.

"We have people who come down, float one day, and fish the next," said Doug Rusk, park superintendent. Many stay in the park, either in the lodging units or in the campground.

An early-morning walk along the misty springs reveals another of the park's attractions. A pair of bald eagles screeched from either side of the stream. The two have built a nest in a ridgetop pine overlooking the park, and have produced chicks for several years.

DNR photo by Scott Myers

(Right) Fishermen line the banks of Spring Branch at Bennett Spring State Park on opening day of trout season. (Below) Montauk State Park visitors enjoy a popular campground along the Current River.

DNR photo by Scott Myers

Trout production, stocking and enforcement of fishing regulations in each park are conducted by the Missouri Department of Conservation. During March 1 through Oct. 31, which is catch-and-keep season, MDC restocks rainbow trout nightly at each park.

DNR photos by Scott Myers

(Top left) All of the trout parks have a variety of lodging options. Campgrounds, motel rooms, duplexes, four-plexes and cabins – like this one at Montauk State Park – offer options for everyone who wants to spend the night. (Above left) There is no guarantee that you will catch a lunker like this 5-pound rainbow reeled in at Montauk State Park. (Above right) Roaring River Spring releases an average 20 million gallons of water a day from a deep gorge in the base of a cliff at Roaring River State Park. The spring – off limits to fishing – is home to many of the park's largest trout.

Naturalist Steve Bost offers a nature program on another resident bird – the turkey vulture – hundreds of which spend fall and winter in the park. The program is called "Roadkill Café" because of the birds' fondness for anything that smells rotten.

"There can be hundreds of them circling on the thermals over the park," Rusk said. "It's pretty amazing to see that many birds just floating around in the sky."

Montauk State Park has the Dorman L. Steelman Lodge, which has a restaurant, store and 18 motel rooms. There also are 28 cabins and more than 150 campsites with two showerhouses. A gristmill built on the river in 1896 is open for tours in the summer.

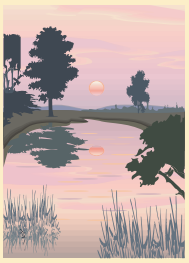
"You can stay in any type of lodging," Rusk said. "We have trails to hike; a lot of people bring bikes down and ride the Lake Trail, where there's always the opportunity to see wildlife. I saw a momma bobcat with four little ones last summer."

The state park system's trout parks have something to interest everyone, whether it's fishing, hiking, camping or just viewing the diverse wildlife.

For more information about Missouri state parks, visit mostateparks.com.

Tom Uhlenbrock is a writer for Missouri State Parks, a division of the Department of Natural Resources.

Lake Monitors Needed



The Missouri Department of Natural Resources Water Protection Program is seeking monitors who live near a small lake to assist with its lake monitoring program. Small residential lakes are ideal for this program as well as publicly owned lakes.

Monitoring includes temperature and Secchi disk measurements every 3 weeks during the recreational season (April through October). Monitors need access to a boat, canoe or other means to monitor the deepest part of the lake. Staff will come to your site to train you and will provide necessary monitoring equipment.

If interested, contact Susan Higgins at 573-526-1002 or susan.higgins@dnr.mo.gov.

Pesticide Pickup Campaign Continues

The Department of Natural Resources kicked off a series of events in March aimed at helping Missouri residents rid their homes and farms of unwanted pesticides and chemicals.

With an event March 9 in West Plains, the department kicked off the second round of the Missouri Pesticide Collection Program. The series of collections are scheduled to run through June while funding lasts. The pickup program allows Missouri households and farmers to safely and legally dispose of pesticides, fungicides, insecticides, rodenticides, dewormers, fly tags and fertilizers containing herbicides or pesticides.

The collection events for 2012 were completed in October with more than 68,000 pounds of waste collected from nine different locations across the state. Currently, about half of the project funds have been expended.

More information on the Missouri Pesticide Collection Program is available online at dnr.mo.gov/env/hwp/pesticide. The program is funded through a hazardous waste enforcement settlement that resulted in more than $1 million being set aside for the cleanup effort.

An independent contractor, The Environmental Quality Co., of Wayne, Mich., will conduct the collection events under the supervision of the Department of Natural Resources.

Park Attendance Contributes to Economic Recovery

Attendance at Missouri's state parks increased in 2012, another sign of Missouri's economic recovery. More than 18 million guests visited Missouri's state parks in 2012.

Increased attendance at state parks also strengthens our state's economy. An economic impact study for the Missouri state park system released in 2012 reported that the total annual expenditure of state parks visitors in 2011 was approximately $778 million. The overall economic impact of these expenditures is estimated at $1.02 billion in sales, $307 million in payroll and related income, and $123 million in federal, state, and local taxes. Visitors' expenditures also support 14,535 jobs in Missouri.

Parks Host 2013 Learn2 Series

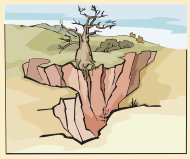
Missouri State Parks will again host its Learn2 series in 2013, providing opportunities for visitors to learn various outdoor skills.

June will focus on camping in several scenic state parks. New participants that are selected to participate in the program will be taught the basics of camping in the outdoors. This will include proper tent placement and setup, how to prepare, activities to do while camping, emergency preparedness, building campfires, outdoor cooking, and of course, s'mores. Campers will also be treated to an outdoor program by a park naturalist and will get the chance to explore the participating park.

Learn2Paddle in July and August will take place on flat water lakes within Missouri state parks. Learn2Paddle will introduce beginning kayaking to those new to the sport. Participants will be taught essential techniques and procedures including basic paddling strokes, essential equipment, different types of kayaks, communicating in the water, how to get back in the kayak after tipping over, and most importantly, safety.

Registration for the programs is available online at mostateparks.com/learn2camp.

Sinkholes in Missouri



The tragedy following a sinkhole collapse that killed a Tampa man is reported to be the first to claim a life in Florida. Sinkholes are a natural and common feature of Florida's landscape and also occur in Missouri. Periods of drought followed by rain events can contribute to sinkhole formation and collapse.

Sinkholes are depressed or collapsed areas formed by the dissolution of carbonate bedrock or the collapse of underlying caves. They range in size from several square yards to hundreds of acres and may be very shallow or hundreds of feet deep. Sinkholes are part of what is referred to as "karst" topography, which also includes Missouri's caves, springs and losing streams.

Much of the state is underlain by soluble carbonate bedrock that has the potential for karst development. Water moving through tiny cracks in limestone and dolomite slowly dissolves the rock and carries it away in solution. Through this process, large caves and caverns can develop at depth. As rock is removed, the soil above washes into the void space.

With time, sinkholes can eventually form on the surface.

The department's Division of Geology and Land Survey provides technical assistance to the citizens of Missouri by evaluating the causes and repercussions of sinkhole development and collapse. Staff geologists perform visual reconnaissance to determine if collapse or landslide is attributed to a natural karst feature or failure of a man-made feature. Learn more about sinkholes and other geologic hazards at dnr.mo.gov/geology/geosrv/geores/geohazhp.htm.

National Trails Day Celebrations

On June 1, Missouri State Parks will celebrate National Trails Day, the nation's largest celebration of trails. Last year, Missouri residents, parks, and businesses hosted a combined 40 events, giving Missourians the opportunity to connect with their local communities, forests and parks.

National Trails Day is a series of outdoor activities designed to promote and celebrate the importance of trails in the United States. Individuals, clubs and organizations from around the country host National Trails Day events to share their love of trails with friends, family, and their communities.

Troutapalooza Events Continue

Missouri State Parks unveiled Troutapalooza on March 1, proclaiming 2013 the Year of the Trout. Troutapalooza will continue throughout the season, featuring a series of events designed to engage experienced anglers and introduce new participants to the activity. The trout catch-and-keep fishing season runs until Oct. 31, and Missouri State Parks has three trout parks for visitors to enjoy: Roaring River State Park near Cassville, Bennett Spring State Park near Lebanon, and Montauk State Park near Salem.

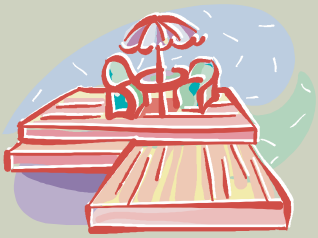
Troutapalooza includes activities to promote fishing for all ages and skill levels. The following activities and events being planned to take place throughout the season: Trout Park Passport Program, monthly Learn2 Fish clinics, weekly drawings, tournaments, coloring contests, and special programs and activities. To find the latest information on Troutapalooza in Missouri state parks, visit Facebook.com/Troutapalooza.

Permit Modifications List Available Online

Facilities or businesses that actively treat, store – for more than 90 days

environmental notes

Bored with Wood?
Try Composites!



Spring and summer are times for backyard barbecues and lazy days in the shade. Many people enjoy both of these activities on a deck behind their dwelling. Decks are great for entertaining, but sometimes their upkeep can be a chore. If you are in the market for a new deck or updating an old one, consider composite decking instead of traditional wooden lumber.

Composite decking is not an entirely new product, but in recent years it has grown in popularity. Composed of recycled wood particles and plastic from milk jugs and shopping bags, it carries many benefits over its wooden counterpart. Composite decking is a low-maintenance alternative that never requires staining or resealing. It will not stain, is durable, comes in a variety of colors and textures, and usually only requires a power washing once or twice a year. It will not rot, termites will not damage it, and most manufacturers claim that it will last 2-3 times as long as wooden decking. Combine these features with a product made from 70 percent to 95 percent recycled materials, and it is hard to not consider it as an option.

While the benefits seem to make composite decking a no-brainer, it is important to make sure you choose the right material for the job. Some composite decking can have a tendency to sag over time, depending on the types of plastic used. If the particular brand chosen does not include UV protection, boards could fade as they get older. In addition, once wood particles have been combined with plastic, these boards are difficult to recycle again. Composite decking is generally more expensive than traditional wood but also can vary widely in cost. While composite decking may end up being more expensive, this may be offset by a savings on maintenance, when compared to traditional wood decks over their lifespan.

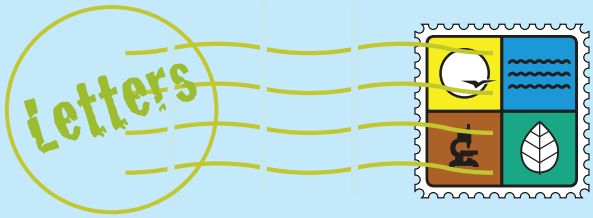
If considering composite decking for your home, make sure to understand the differences between brands. The material should come with a manufacturer's warranty and may need to be installed by a professional. In addition, you should ask to see examples of stress-tested boards to see how they look after some outdoor exposure. Finally, following proper maintenance procedures will keep your deck in tip-top shape for years of enjoyment, whether you choose composite lumber or traditional wood.

Sources:
Recycled Plastic and Composite Lumber – BuildItGreen.org
EPA Background Document for the Final Comprehensive Procurement Guideline (CPG) III and Final Recovered Materials Advisory Notice
Cedar Vs. Composite Decks – Western Red Cedar Lumber Association
GreenExpo365.com. A Short Read on the Differences in Composite Decking

– or dispose of hazardous waste in Missouri must get a hazardous waste permit, which lists how and what kinds of hazardous waste the facility can manage. It also lists the facility's operating conditions and closure, corrective action and necessary financial assurance requirements.

The department or the facility can make changes to the hazardous waste permit throughout its life. Permit modifications are labeled as Class 1, 2, 3 or department-initiated, depending on how much they change the original permit conditions.

The public is invited to review the Department of Natural Resources' list of all approved hazardous waste per-



I was very excited to see the Time Exposures article about Lovers Leap, in the 2013 winter edition of *Missouri Resources*. I'm most familiar with Lovers Leap in Hannibal, since I was born and raised here and have lived here all of my life (64 years), except for six years.

The two photos of 1915, are very interesting. The article states that "the horizontal photo was likely taken atop Cardiff Hill." The photo was actually taken atop Lovers Leap and looking northward, over Hannibal, toward Cardiff Hill.

Thank you for a wonderful magazine!

Larry Bross
Hannibal

Editor's Note:
As Larry pointed out, the photo in Times Exposures is indeed a view of Hannibal from atop Lover's Leap. In the foreground of the view, you can see the location of the old railroad roundhouse as well as the river on the east side of town. We also have verified this with the Hannibal Convention and Visitors Bureau. Our apologies and thanks to Larry for taking the time to alert us to the error.

Congratulations to you and your staff for a very nice and interesting magazine. It is a good way for ordinary citizens to know what is happening in our state and to appreciate the work of DNR. Thank you.

Clyde Dickerson
Shell Knob

Thank you for the Huzzah Creek spillway picture featured on the back cover of the winter issue of *Missouri Resources*. Huzzah Creek begins on my paternal grandfather's farm in southern Dent County and meanders through the little Howe's Mill community (and my farmland) until it reaches the confluence with the eastern branch at the spillway.

I have fond memories of my childhood in this area.

Vivian J. (Mrs. Robert W.) Jordan
Salem

Please accept my very sincere congratulations and thanks for the winter 2013 issue of *Missouri Resources*. I found it to be the best yet! I enjoyed it overall, and found it informative on so many subjects. "Moo Juice" will go a long way to address the problems from concentrated animal operations we have.

In particular, thank you for the "Battle of Island Mound" article. I will be passing this one to friends that will, I know, be delighted to know of this new historic site. When I stumbled onto the national park site (George Washington Carver National Monument) in Diamond, Mo., (thanks to highway signs) I also shared that. It is amazing how little is done to promote these positive aspects of our history.

Ronald N. Carter
St. Louis

I have been fascinated by dye tracing in sinkholes for a long time. I am in my 85th year and I've often wondered what is the longest distance on record of dyed water emerging, and where did some of the dyed water emerge? Also where is the largest sinkhole in Missouri and how many sinkholes have been found? How deep do sinkholes get?

Thanks, I enjoy *Missouri Resources* and when I was teaching, I often quoted your magazine.

Frank Gruswitz
St. Louis

Editor's Note – Peter Price, Division of Geology and Land Survey responds:
The longest dye trace we recorded is roughly 39 miles long (Eleven Point River to Big Spring). We have verified 15,981 sinkholes – and expect many more exist. The largest encompasses about 700 acres in western Boone County. Records aren't kept about depth, but we know some are greater than 100 feet deep. For more information visit: dnr.mo.gov/geology/geosrv/envgeo/watrace.htm; dnr.mo.gov/geology/geosrv/envgeo/eau.htm; and dnr.mo.gov/magazine/2010-winter.pdf#page=25.

Letters intended for publication should be addressed to "Letters," *Missouri Resources,* PO Box 176, Jefferson City, MO 65102-0176 or faxed to 573-522-6262, attention: "Letters." Please include your name, address and daytime phone number. Space may require us to edit your letter. You also can email *Missouri Resources* staff at moresdnr@dnr.mo.gov.

Stream Team Notebook

Stream Teams Monitor a Fisherman's Paradise

Bennett Spring State Park near Lebanon, Mo., often called a "fisherman's paradise," is home to the Ozarks' fourth largest spring, a fish hatchery, a unique natural tunnel and a Stream Team Volunteer Water Quality Monitoring project. Three Stream Teams represented by six individual members have monitored water quality at Bennett Spring every month for the past year. Billy Backues, Carolyn Solomon and Marvin and Lucy Silliman, representing Stream Team 4193, are working diligently with Carl Romesburg of Stream Team 3117 and Dennis Trudeau of Team 3688.

DNR photo by Susan Higgins

Stream Team members prepare to put their chemical kits to work at Bennett Spring State Park. Left to right are Carl Romesburg, Billy Backues, Marvin Silliman, Dennis Trudeau, Lucy Silliman and Carolyn Solomon.

Romesburg and Trudeau met Backues at a VWQM introductory workshop. After becoming acquainted, they quickly discovered that they had similar interests and could assist one another with their monitoring responsibilities. Solomon and the Sillimans knew Backues from their membership in the Lake of the Ozarks Missouri Master Naturalist Chapter.

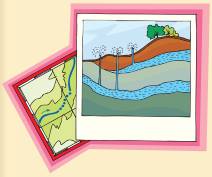
After receiving a call from the Bennett Spring hatchery asking for volunteers to monitor the water quality above Holland Dam in the state park, Romesburg knew just who to call. This faithful group of monitors rallied around the idea and some of them manage to combine their volunteer activities with pleasure, often bringing their fly rods along so they can do a little fishing after monitoring duties. As monitors, they do macroinvertebrate and chemical monitoring while using the historic gauge in the park for stream discharge measurement.

It is easy to see this group is well organized and dedicated to protecting water quality at Bennett Spring. If you are ever visiting the park and see them working, stop by for a chat. They will gladly show you what they are doing, but be careful, you just might find yourself regularly monitoring with them.

MISSOURI STREAM TEAM

mit modifications for calendar year 2012. The permit modifications list is online at dnr.mo.gov/env/hwp/permits/publications.htm. For more information or a hard copy of the list, contact the department's Hazardous Waste Program, Permits Section, at 800-361-4827. Hearing- and speech-impaired individuals may call Relay Missouri at 800-735-2966.

Geologic Maps Published



Four new geologic maps are available for portions of Callaway, Jefferson and St. Louis counties. The department's Division of Geology and Land Survey created the maps through the STATEMAP component of the National Cooperative Geologic Mapping Program, which is co-funded by the U.S. Geological Survey.

Bedrock and surficial maps are available for Fulton and Manchester quadrangles. Bedrock geologic maps provide information about the existing layering of bedrock and faulting, folding or deformation, and information about the distribution of rock such as limestone, sandstone, coal and granite. Surficial material maps describe those deposits that occur above the bedrock layer. This includes soil, along with details about deeper unconsolidated material.

Geologic maps benefit landowners, farmers and government agencies by building a regional picture of the distribution of geologic materials that store groundwater or provide recharge to valuable groundwater aquifers. They provide a strong scientific basis for making informed regulatory decisions that ensure protection of public and environmental health, such as siting landfills or cleaning up groundwater contamination. All mineral, energy, water, industrial construction, public works and urban development projects can benefit from a geologic map.

Used in applications including earthquake and other natural hazard evaluation, geologic maps also aid engineers and planners in identifying rock materials for the construction of critical infrastructure such as highway bridges, dams, tunnels and pipelines. Geologic maps help create strategies for resource development and environmental protection. Geologic and topographic maps may be purchased online at missourigeologystore.com or

Time Exposures

Although officially incorporated in 1853, Kansas City had been a thriving community since the 1830s. The Kansas City neighborhood now known as the River Market was originally called Westport Landing. Land along the Missouri River in the western part of the state often has steep loess hills and bluffs – Kansas City was no exception. In 1833, John Calvin McCoy developed a boat landing carved from a natural rock ledge on the south side of the river. It was used to receive goods via the river destined for the town of Westport, four miles to the south. Those items were then sold to settlers heading west on the Santa Fe Trail. Grand Avenue, along with Main and Delaware streets, were deep ravines that cut through the bluffs. These geologic features were developed as streets that led from the river to the residential and commercial areas of the south. The rugged topography limited development of the area and the land was eventually leveled. This photograph from 1886 shows workers grading the river bluffs at the intersection of Fourth and Grand streets.

Photo from the Missouri Valley Special Collections, Kansas City Public Library, Kansas City, Mo.

Send your photo to "Time Exposures," c/o Missouri Resources, PO Box 176, Jefferson City, MO 65102-0176. Original photos will be returned via insured mail. Pre-1970 environmental and natural resource photos from Missouri will be considered. Please try to include the date and location of the picture, a brief description and any related historic details that might be of interest to our readers.

at the DGLS central office at 111 Fairgrounds Road, Rolla.
Learn more at dnr.mo.gov/geology/statemap/missouri-maps.htm.

Study Grant for Normac Sewer District

The Missouri Department of Natural Resources has awarded $41,000 to the Lake of the Ozarks Council of Local Governments to study the possibility of extending the Normac Sewer District near Camdenton.

The sewer line extension feasibility study will help the council understand past precedent and establish a future vision for the land to outline the best plan for extension of the existing collection system. Extending the existing system will add more customers, which will lower the monthly rates being paid by current Normac Sewer District customers. Adding more customers to the district will also benefit the environment as it will reduce the number of permitted outflow points and on-site (septic) wastewater systems in the area.

The feasibility study will be used to develop and to identify the current regional infrastructure and recommend suitable locations for potential long-term investments, and improve water quality in the region.

Contributing partners in this collaborative wastewater study include the Camden County Health Department, Camden County Assessor, Camden County Waste Water Department, Camden County Sewer Board, Missouri Spatial Data Information Services, Missouri Association of Council of Governments and Missouri Department of Natural Resources.

The U.S. Environmental Protection Agency, Region 7, has provided partial funding for this project under Section 319 of the Clean Water Act. The Department of Natural Resources' Water Protection Program will administer the grant funds. The department is committed to working closely with communities and businesses to assist with funding efforts that improve water quality in Missouri.

For news releases on the Web, visit dnr.mo.gov/newsrel/.

For a complete listing of the department's upcoming meetings, hearings and events, visit the department's online calendar at dnr.mo.gov/calendar/search.do.

Looking for a job in natural resources? Go to dnr.mo.gov/hr/.

Resource Honor Roll **Dave Murphy**

Conservation Federation of Missouri photo

Dave Murphy

Dave Murphy, who recently retired as the Executive Director for the Conservation Federation of Missouri, grew up with an enthusiasm for spending time outdoors through hunting, fishing and trapping. Along the way, he also developed a true passion for natural history. Murphy soon became a dedicated and respected conservationist and environmentalist.

Murphy grew up on his family's farms in Lewis and Clark counties in northeast Missouri. He earned his Bachelor of Science degree in Forestry, Fisheries and Wildlife in 1976 and attained his Master of Science in Wildlife Biology in 1983.

Murphy spent the beginning of his career working on wildlife research for the Missouri Department of Conservation. He eventually began looking for opportunities to fulfill his quest to become an engaged and dedicated conservationist.

Murphy augmented his efforts by becoming an active volunteer for several private conservation organizations including Trout Unlimited, Quail Unlimited, the Ruffed Grouse Society and especially, the National Wildlife Turkey Federation.

"I believe absolutely in the value of ordinary folks working together to accomplish extraordinary feats," said Murphy.

His positive, collaborative attitude led Murphy to a career as the Regional Field Supervisor and Regional Director for the National Wildlife Turkey Federation. Under his direction, the federation grew from 11 local chapters to more than 200 with over 600 members that generated in excess of $2 million net each year for conservation projects. Murphy's 10 years of service with the Conservation Federation of Missouri also brought similar results while enhancing and maintaining the relevance of the outdoors to every living and future Missourian.

His dedication as a conservationist and environmentalist has been recognized by many organizations, such as *Outdoor Life's* 25 Most Influential People on the Future of Hunting and Fishing, and Bass Pro Shops' 2012 Conservation Partners of the Year, awarded to Murphy and Sara Parker Pauley.

Murphy and his wife, Gunilla, will continue to run their family's tree farm in Fairmont and will most certainly remain active in working to protect our precious natural resources.

Rock Matters

Glacial erratic

Taking their names from the Latin word *errare*, erratics are rocks that differ from size and type of rock native to their surroundings. During the ice age, glaciers carried rocks and soil into Missouri from South Dakota, Iowa, Minnesota, Wisconsin, Michigan and Canada.

(Left) Glacial erratic in Sullivan County. DNR photo by Jerry Vineyard. **(Bottom) Most erratics in Missouri are composed of Quartzite (left) or gneiss (right).** DNR photos by Mark Gordon.

When the glaciers melted, the rocks and soil remained in deposits of till that is sometimes more than 300 feet thick. The rocks are usually composed of igneous and metamorphic rock types most resistant to weathering. While the erratics were trapped within glacial ice, they were rubbed against each other, as well as the bedrock they moved over during their journey south. Erratics may be found with flattened sides and grooves etched into them as a result of this abrasion.

Quartzite and gneiss (rhymes with nice) are the most common glacial erratics in Missouri. Much of the quartzite found in Missouri is believed to have originated in South Dakota and is known as Sioux Quartzite. It is commonly red to purple and is metamorphosed sandstone, composed primarily of the mineral quartz. It is generally grey or pink, has a banded appearance, and is made up of granular mineral grains, typically containing abundant quartz or feldspar minerals. Erratics composed of anorthosite, andesite, basalt, diorite, gabbro, granite, granodiorite, greenstone, schist, slate and syenite may also be found.

The size of erratics can range in size to that of pebble-size particles to boulders the size of cars. Occasionally very interesting pieces are discovered, such as native copper from Michigan or banded iron formations from Minnesota. One glacial erratic composed of granite and located in Sullivan County, is estimated to weigh more than 750,000 pounds!

No oven, no grill ... No Problem

by Ming Xu and Angie Morfeld
photograph by Scott Myers

You've heard the old saying, "It's hot enough to fry an egg on the sidewalk!" As you prepare for the 2013 camping season, the Missouri Department of Natural Resources' Division of Energy challenges you to put this old adage to the test, sort of.

"Make your campouts a little different this year by incorporating solar cooking," said Llona Weiss, director of the division. "Whether you utilize a commercial or homemade cooker, you'll enjoy easy, fuel-free cooking using a renewable energy source."

The benefits of solar cooking are abundant. First, food generally tastes better when cooked by the sun's natural heat. The temperature within a solar cooker rises slowly and more evenly, preventing overcooking and allowing the food time to release its natural flavors. In addition, because there is no air movement with solar cookers as there is with conventional ovens, food tends to stay moist and tender. Since solar cooking doesn't require electricity or conventional fuels like propane or wood, it is pollution free. You can bake, boil or steam any kind of food by harnessing the power of the sun, without hurting the environment. Best of all, it's a fun, personal or family activity.

"Solar cooking offers a wonderful learning opportunity, especially for kids," said Doug Dunn, a maintenance worker with the department.

Dunn started solar cooking three years ago with his Boy Scout troop and has done demonstrations at the department's Earth Day celebration, the Missouri State Fair and other events. He views it as a reliable cooking source, even during low temperatures or when the use of an open flame is neither practical nor safe.

"During the 2012 drought, many camping areas banned the use of traditional campfires," Weiss said. "You will never have that problem with solar cooking. It can be used in any circumstance. All you need is strong sunlight."

Dunn agrees, "The first time I baked cookies in a solar oven was in the fall, and the temperature was 38 degrees. The cookies baked just the same as they would on a warmer day."

Doug Dunn, a DNR General Services employee, prepares chocolate chip cookies on his solar cooker. Although it was a cool April morning, ample sunshine provided more than enough heat.

A variety of commercial solar cookers are available, ranging from less than $20 to more than $300. You also can build one with aluminum foil and cardboard, which allows you to experiment with solar cooking without a big investment.

Dunn reminds solar cooks to think safety first. "Always remember to wear sunglasses and use pot holders to protect yourself when cooking with the sun."

The following links provide more information about creating your own, inexpensive solar cookers: solarcooking.wikia.com/wiki/Category:Solar_cooker_plans, and; www1.eere.energy.gov/education/pdfs/solar_oven.pdf.

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